Climatic Change (2023) 176:133
https://doi.org/10.1007/s10584-023-03609-x

Determining the willingness to link climate and trade policy

Marcel Lumkowsky[1] · Emily K. Carlton[2] · David G. Victor[2,3,4,5] · Astrid Dannenberg[1,6]

Received: 9 June 2023 / Accepted: 7 September 2023 / Published online: 25 September 2023

Abstract
Analysts have long advocated a linkage between international cooperation on climate change and trade measures, such as border tariffs, as a means of enforcing agreements to achieve deeper cooperation. Nevertheless, it has remained difficult to evaluate whether policy makers will allow such linkages and whether linking climate and trade would, in reality, yield beneficial effects to international cooperation. Working with a large sample of climate experts who are highly experienced in climate diplomacy and policy, we elicited how they view the legitimacy and usefulness of linking trade and climate and what factors can explain those views. We find that experts from richer countries, especially Europe, are more likely to see linkage as legitimate and effective. These experts are particularly likely to favor universal border adjustments (UBAs) that apply to all countries to level the economic playing field, rather than trade measures that define an exclusive "club" of countries making extra efforts to cut emissions while punishing non-club members. This finding reveals tensions between a shift in academic thinking about the value of club-based strategies—including clubs that use border measures for enforcement—and what climate policy experts see as valuable. European experts are particularly likely to favor UBAs and they are also least likely to see risks in implementing trade measures. In general, countries with high quality national institutions see lower risks in using trade measures to enforce greater cooperation on climate change. A particularly robust finding is that experts who perceive their home country's emissions reduction pledge as ambitious are more likely to see risks from using trade measures. While these are the countries that could benefit the most from using trade measures, they are also the countries that are offering the most under the existing Paris Agreement. Experts seem to be increasingly aware of the dissonance between the voluntarism of the Paris Agreement and growing political pressures to apply trade measures. We also find the attributes of experts, such as training and career experience, can affect their assessments. In some models, experts with economic or business backgrounds are more likely to favor trade measures while those with careers in natural science, diplomacy, and national government are less sanguine. Our results suggest that diverging views on the need for trade-based enforcement are robust, associated with important attributes of countries such as their commitments, and likely to persist—suggesting that policy strategies favoring the use of trade measures must pay close attention to the conditions that will determine where and how trade measures can be implemented. Experts from many countries that are the biggest supporters of the Paris approach to climate cooperation also doubt the legitimacy of trade measures.

Extended author information available on the last page of the article

Keywords Climate change · Carbon tariffs · International trade · Trade agreements · Paris Agreement

1 Introduction

For years, there has been lots of talk and diplomacy around climate and little action. This is now starting to change, possibly quickly. In some parts of the world, aggressive action is taking hold, often in ways that are very costly to industry. A recent study by the International Energy Agency (IEA) has suggested that these kinds of policy actions—amplified by energy security concerns in the wake of the Russian invasion of Ukraine—will cause a peak in the consumption of fossil fuels and a long-term reduction in emissions (IEA 2022). Other studies have made that case even more stridently (Bond and Butler-Sloss 2022; Verleger and Victor 2022).

All this policy effort has raised questions about how to correct for the disadvantages, such as loss of economic competitiveness, that arise for the jurisdictions that move first and how to motivate the remaining countries to make more efforts. Analysts have suggested linking climate policy and trade policy to these problems, which can be done in two distinct ways. One is the universal application of border adjustments so that all products and production methods face the same costs of production (Flannery et al. 2020; Bowen et al. 2021; Bacchus 2022). Jurisdictions that bear higher production costs impose these adjustments so that, in effect, the economies that make less of an effort gain less or no economic advantage. The most prominent example of such a universal border adjustment (UBA) is the EU's carbon border adjustment mechanism (CBAM) that is being implemented today (European Commission 2021). A second possibility for linkage is to tailor trade measures, along with many other elements of industrial policy, to define "clubs" of countries and firms that are allied to move quickly as they create industries of the future (Victor 2011; Nordhaus 2015). Countries inside the club would have one (much lower) tariff on trade in goods and services whose production causes emissions; countries outside the club would be penalized with much higher tariffs or even trade prohibitions.

Whether and how to link climate policy and trade policy is a topic of growing importance on diplomatic and national climate policy agendas (Bacchus 2022). Many visions for how to achieve deep cooperation on climate presume that strong trade measures will be available and used to penalize countries that don't make adequate effort and reward those that take action (Victor 2011; Nordhaus 2015). Indeed, the question of trade measures—and thus enforcement—has been a factor looming over international diplomacy on climate change ever since it began in the early 1990s (Barrett 2006). Because such measures are powerful as a means of enforcing obligations and could be applied in ways that are insensitive to countries' abilities and responsibilities, they have been controversial and unacceptable to at least some countries. Thus, in practice, they have been rejected formally from any inclusion in the universal consensus-bound United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and most recently the Paris Agreement (Bodansky 1993; Barrett 1997, 2006; Bacchus 2022; Barrett and Dannenberg 2022). That rejection has led analysts to argue that creating incentives for deeper cooperation on climate change requires looking outside the UNFCCC to trade institutions themselves—notably the World Trade Organization (WTO) (Bowen et al. 2021; Hillman and Tippett 2021; Victor and Sabel 2022). Yet within the WTO proposals for possible formal inclusion of climate change has led to diplomatic gridlock across the large number of WTO members with diverging interests (World Trade Organization 2022). Trade

lawyers have offered interpretations of WTO jurisprudence that would allow countries to use environmental goals, such as climate change, as an acceptable reason to impose trade measures (Bacchus 2017; Porterfield 2019; Dias et al. 2020; Vidigal and Venzke 2022). Indeed, in recent years, both the EU and the USA have advanced far along in developing various trade measure proposals that would compensate the first-movers and perhaps motivate late-movers while aligning with the WTO in ways that could portray those measures as legitimate and legal (Directorate General for External Policies 2020; Flannery et al. 2020; European Commission 2021).

The concerns about legitimacy arise, in part, from sharply diverging perspectives on what trade measures are intended to do (Hufbauer et al. 2022). For some, trade measures are about leveling economic playing fields by punishing countries that aren't seen as doing enough. By that logic, trade measures are an essential element of cooperation because they can realign costs and benefits and reduce the incentives to free ride on others' efforts. Leaders might be averse to adopting costly policies at home if their firms and workers face competition in a global economy against firms and workers in countries that don't bear those policy costs; trade measures can rectify those terms of trade and make it economically and politically easier for leaders to forge ahead (Barrett 2006; Victor 2011; Nordhaus 2015). Still others see trade measures in the context of what has emerged from the diplomacy leading to the Paris Agreement, which explicitly rejected the inclusion of formal enforcement mechanisms because the agreement sought legitimacy through universal membership and a system of flexible nonbinding pledges designed, in part, to reflect the "common but differentiated" starting points of different countries (Bodansky et al. 2017). By this logic, legitimacy hinges on adhering to norms established in the key international agreements on climate change (Falkner 2016). Since the diplomatic record makes it clear that many countries explicitly rejected a punitive system that could impose common expectations on all countries in the global economic system—even if that approach leveled the economic playing field with the aim of achieving more cooperation—no trade measure may be perceived as legitimate. Legitimacy matters because there is considerable evidence that international agreements seen as legitimate lead to higher levels of participation and perhaps also efficacy (Bodansky 1999; Franck 2006; Brunnée and Toope 2010). Managing this tension between the possible usefulness of trade measures (in the eyes of some) and the erosion of legitimacy (in the eyes of others) means that any system of trade measures contemplated will come with large risks as it is designed and applied. Those risks include retaliation, such as through other trade measures, and also erosion of norms and institutions needed for international cooperation more broadly. In a world already facing many geopolitical stresses, those broader norms and institutions are important for both addressing climate change and for maintaining world order.

Thus, in the academic and policy debates around climate policy and trade effects, three overlapping questions have emerged—around the legitimacy of such measures, around their usefulness, and the risks from their use. This paper is about those three central questions.

2 Theoretical framework

2.1 The concepts of legitimacy, usefulness, and risks of trade measures

All three of these overlapping concepts—legitimacy, usefulness, and risk—have proved hard to measure in practice, and, perhaps as a result, have resulted in large academic and policy literatures without much convergence of the different positions.

Regarding legitimacy there has been extensive debate, especially by international lawyers, about whether individual nations should be allowed to use economic power in the international system to impose their climate standards on other countries—especially those less responsible for the problem and less capable of addressing it (Khor et al. 2017; Hillman and Tippett 2021). The question of legitimacy is important to international cooperation because measures that are not perceived as legitimate are often harder to sustain and also, as many scholars have suggested, command lower levels of compliance and impact (Brunnée and Toope 2010). While there is widespread agreement among scholars that legitimate measures are also more useful, what really matters are the tradeoffs—if legitimacy requires widespread consent to the content of an international agreement but the process of earning consent dilutes the ambition of that agreement then the search for legitimacy could prove a costly drag on international cooperation (Victor et al. 1998; Abbott and Snidal 2000; Raustiala 2005). Such tradeoffs are one of the many areas where policy elites make strategic choices with regard to the design of international institutions and strategies concerning their country's membership in those institutions—choices that are often guided on the basis of intuition and experience (Hafner-Burton et al. 2017).

Regarding usefulness, many studies have looked at the value of using trade measures to induce countries to control emissions (Nordhaus 2015; Bacchus 2019; Clifford Chance 2021; Bowen et al. 2021; Hillman and Tippett 2021). A central theme in this research is that there are both economic and political benefits from using trade measures. Economically the benefits are widely understood to offer an answer to the problem of "leakage"—a phenomenon that occurs when some parts of the global economy are highly regulated and others are not, leading investment and production to flow to the less regulated jurisdictions (Barrett 1997, 2006; Nordhaus 2015; Bacchus 2022; Barrett and Dannenberg 2022). Leakage can undermine the efficacy of collective environmental policy because it creates incentives for countries and industries to avoid regulation. In the extreme, this free rider effect, as it is sometimes known, can create a race to the bottom where industry pressures government to have weaker regulation than their trading partners. Politically, trade measures can be extremely important because often one of the strongest arguments against costly local policies is that trading partners are not undertaking similar measures and thus have a competitive advantage (Flannery et al. 2020; Bowen et al. 2021; Bacchus 2022). Such trade measures, coupled with investment and policies that support new technologies, help create groups of industrial firms that favor further action on climate change—a dynamic process through which climate policy shifts political interests and begets still more climate policy (Victor and Sabel 2022).

Regarding the risks of using trade measures, the literature is huge (Böhringer et al. 2012; Bacchus 2017, p. 201; Mehling et al. 2017; Cosbey et al. 2019; Koester et al. 2021; Hillman and Tippett 2021). Even trade measures that are designed for alignment with WTO rules can, when threatened or applied, devolve into tit-for-tat retaliation that generates animosities in an international system where support for institutions such as the WTO is already fraying. Intended to bolster support for climate action, such an approach could have the opposite effect—making it harder for public and private actors working on practical solutions in different countries to forge and sustain collective action. If countries know they might be penalized for inadequate climate policies they might make their climate actions much more opaque and harder to measure. They might, as well, avoid trying out new, unfamiliar policies for fear that such actions would not be recognized if they do not yield exact compliance with voluntary pledges made under the Paris Agreement. Policy makers know about these risks and often weigh them when they make choices about institutional design (Hafner-Burton et al. 2014).

2.2 A novel approach to measuring legitimacy, usefulness, and risk of trade measures

We offer a novel way to measure legitimacy, usefulness, and risk: ask highly seasoned climate policy experts who, as part of their professional lives, exercise judgments on such questions on a regular basis. Experts are a valuable source of information when variables of interest are difficult to observe and measure directly and require specialized domain knowledge and deep experience to evaluate (Dannenberg et al. 2010, 2017; Morgan 2014; Dannenberg and Zitzelsberger 2019). When policy tradeoffs require assembling large amounts of information—guided by experience and intuition—it is often invaluable to survey the people who are experienced in making such tradeoffs because they are "in the room" when those choices are debated and made. Survey instruments designed to recreate those tradeoffs can reveal how experts make decisions and how those decisions, in the real world, lead to different types of public policies.

The present study draws on survey data from a unique sample of the very experts who inform and design climate policies, both in their home countries as well as internationally at the annual UNFCCC Conferences of Parties (COPs). They participate in the COPs either directly, as negotiators for their countries, or indirectly, as observer scientists drawn from the influential Intergovernmental Panel on Climate Change (IPCC). In addition to the abundance of domain knowledge, the sample also stands out for its large size (829 experts), geographic representativeness (from over 150 countries), and the degree of experience represented (as shown in Table 1). (The same extensive survey also asked experts about their views on other climate-related topics, such as the quality of national climate pledges and the use of naming and shaming as an enforcement mechanism. We report on those topics in Victor et al. (2022) and Dannenberg et al. (2023), forthcoming.).

2.3 Explaining variation in expert assessments of legitimacy, usefulness, and risk

To probe possible correlates between the characteristics of different countries and experts and their views on the legitimacy, usefulness, and risks of trade measures, we turn to a diverse array of literatures that have engaged with questions of international cooperation—from political science, economics, and law. At the broadest level, we look to four possible clusters of explanations, summarized in Table 2. While we can only demonstrate correlations and not causal effects with the cross-sectional survey, we can reveal whether these correlations are consistent with theoretical explanations.

First, following most studies on political economy of international institutions, we look at two clusters of geoeconomic variables that could influence expert views on trade measures. One is related to economic achievement and categories of economic policies which we proxy with GDP per capita and OECD and regional membership (Bacchus 2019; Maratou 2021). Conceptually, these variables map onto a country's relative capacity to invest early in emissions reductions in key domestic sectors and so become the first movers whose domestic industries would be most advantaged by trade measures. The other cluster of geoeconomic variables is related to dependence on trade and on fossil fuels specifically (fossil fuel rents and CO_2 emissions per capita) as a source of national income. Conceptually, this cluster of variables approximates countries' exposure to the risks of linking climate to trade (fossil fuel extraction and combustion is the single largest source of CO_2 emissions). This also speaks to the literature that sees factor endowments as a major source of policy

Table 1 Overview of the elite sample

	Full sample	Negotiator	Scientist
Absolute			
Respondents	829	599	230
Mean [n]			
Age	52.61 [764]	50.25 [554]	58.82 [210]
COPs as party member	3.48 [766]	4.46 [556]	0.89 [210]
COPs as observer	1.47 [745]	1.40 [535]	1.64 [210]
Frequency [n]			
Gender			
Male	71.15 [555]	68.26 [385]	78.70 [170]
Female	27.18 [212]	30.14 [170]	19.44 [42]
Other	0.26 [2]	0.18 [1]	0.46 [1]
Prefer not to answer	1.41 [11]	1.42 [8]	1.39 [3]
Organization			
National or EU government	37.71 [293]	46.26 [260]	15.35 [33]
International government	6.31 [49]	7.12 [40]	4.19 [9]
Research	33.72 [262]	19.57 [110]	70.70 [152]
Private sector	5.28 [41]	6.23 [35]	2.79 [6]
NGO	9.40 [73]	11.92 [67]	2.79 [6]
Other	7.59 [59]	8.90 [50]	4.19 [9]
Training			
Natural sciences	42.93 [334]	36.83 [207]	58.80 [127]
Political sciences	10.54 [82]	12.81 [72]	4.63 [10]
Economics or business	16.20 [126]	15.66 [88]	17.59 [38]
Law	7.20 [56]	9.43 [53]	1.39 [3]
Engineering	12.47 [97]	14.41 [81]	7.41 [16]
Other	10.67 [83]	10.85 [61]	10.19 [22]
Region/OECD			
OECD Europe	27.99 [232]	24.37 [146]	37.39 [86]
OECD North America	13.63 [113]	6.51 [39]	32.17 [74]
OECD Rest of the World	9.89 [82]	8.18 [49]	14.35 [33]
Non-OECD Asia	13.15 [109]	15.53 [93]	6.96 [16]
Non-OECD Africa	18.21 [151]	24.21 [145]	2.61 [6]
Non-OECD Rest of the World	17.13 [142]	21.20 [127]	6.52 [15]

The total number of respondents refers to participants who answered at least one question that was relevant to our analyses. The number of observations for specific variables (in square brackets) is lower due to missing values (including "don't know"—answers). Region and OECD background variables were constructed using the "home country" indicated by the respondents

preferences (Wettestad and Gulbrandsen 2017; Dolphin et al. 2019; Lamb and Minx 2020; Colgan et al. 2021; Davidson 2021).

Second, we look at the experts' assessments of their home countries' climate pledges under the Paris Agreement—specifically, both the ambition and credibility of those pledges. These variables are measures of the efforts that countries are planning for emission controls and, at the same time, a measure of the belief in the Paris

Table 2 Theoretical explanators for expert perceptions of climate-linked trade measures

Category	Measurement variables	Source
Geoeconomic position	OECD membership	OECD
	GDP per capita	World Bank
	Trade dependency	World Bank
	Fossil fuel rents	World Bank
	CO2 per capita	European Commission
Quality of pledges	Self-assessed ambition	Our survey
	Self-assessed credibility	Our survey
Quality of national institutions	Institutional quality	World Economic Forum
	Polity index	Polity IV Project
Type of respondent	Domain of expertise	Our survey
	Professional training	Our survey
	Experience at COPs	Our survey
	Gender	Our survey

Detailed descriptions and descriptive statistics for each variable are reported in Tables S9 and S10 of the SI

Agreement approach that aims to catalyze cooperation through reciprocating voluntary contributions. Large efforts to implement policies in the wake of announcing ambitious emission reduction plans would predict support for the use of trading instruments: countries that incur costs at home will favor requiring other countries to also bear those costs. On the other hand, in countries that make, but are less likely to honor, ambitious commitments policy makers may be much less supportive of trade measures that could impose penalties on their economy for falling short. By this logic, analysts must look for explanation of attitudes toward trade measures by looking at both the pledges and expected compliance. Proponents of the voluntary approach of the Paris agreement may object to introducing sanctions that, in effect, are enforcement mechanisms in a regime that was designed to emphasize pledging rather than formal compliance.

Third, we look at the quality of national political and administrative institutions as those may affect the ability of countries to design and implement national policies in ways that synchronize well with international trade measures (Keohane 2001; Brunnée and Toope 2010; Victor 2011; Marshall et al. 2019; Genovese and Tvinnereim 2019; Tørstad et al. 2020; Davidson et al. 2021; Finnegan 2021). One of the major challenges in designing and applying trade instruments is knowing exactly which kinds of trade effects need adjustment. These kinds of administrative functions are often highly technical, require huge amounts of data, and also benefit from high levels of trust between regulated industries and government officials. The countries with very high administrative capacity may be particularly able to ensure that actions at home stay aligned with international legal obligations and are implemented in an even-handed way.

Fourth, we control for the type of expert making the assessment. The domain of expertise (climate science, economics, law and diplomacy, etc.) can affect perceptions because expertise, along with other factors, influences the mental models that people use to evaluate complex information. Moreover, expertise is domain specific and depends, as well, on the duration of experience (Eisenstadt and Kareev 1975; Hafner-Burton et al. 2014).

3 Methods

3.1 Data collection and sample

Our empirical results are based on data from a survey of climate policy experts who were invited via email between September 2020 and January 2021. The invitation email contained a short introductory text and a link to an online questionnaire provided on the QuestionPro platform. The research was evaluated and approved by the Ethics Committee of the University of Kassel, Germany. All participants in our study gave informed consent before participation.

Participants stem from two sources: the UNFCCC (negotiator sample) and the IPCC (scientist sample). The negotiator sample is based on the lists of participants published by the UNFCCC after each COP. For COPs 16 to 25 (2010 to 2019), email contacts for individuals who were listed as a party member at least once were taken from previous studies or searched for on the Internet. Individuals who attended the COPs as observer only (and never as party) were not included. The scientist sample consists of authors or reviewers of the Fifth Assessment Report by the IPCC. The list is available on the IPCC website and the email addresses were obtained through Internet searches.

A total of 978 individuals from 162 countries participated in the survey (700 negotiators, 278 scientists), meaning that they answered at least some of the survey questions. A total of 829 individuals (599 negotiators, 230 scientists) answered the questions relevant to this article. The number of observations varies across questions because some respondents did not answer a certain question, answered it with "don't know," or dropped out from the survey at some point. In the econometric analyses, respondents were excluded when relevant information for their respective home country was not available to be used as explanatory variable which additionally lowered the number of observations. To calculate the response rate, we set the number of individuals who answered the questions relevant to this article in relation to the number of individuals who were contacted and verifiably opened the link to the survey (1768 in total, 1313 negotiators, 455 scientists). Following this approach, the overall response rate is 47% (46% negotiators, 51% scientists). There is no other way for us to calculate the response rate because we do not know how many individuals actually received and saw the invitation. Many of the contact addresses, some dating back to 2010, are no longer valid or active.

Table 1 presents an overview of the sample, for the full sample and separately for negotiators and scientists. The sample is comprised of highly experienced climate policy experts. This is indicated by an average of 3.5 COP participations as party member (with a maximum of 25 COPs). This value is of course higher for negotiators (4.5) than for scientists (0.9). In terms of demographics, the sample is made up by more males than females or participants who identify with other genders (71% versus 29%). Participants have a mean age of 53 years, with a range between 23 and 87 years. The majority of respondents from the negotiator sample are working for national or international governmental institutions, whereas scientists are mainly employed in research institutions. For both groups, most participants received their professional training in natural sciences followed by economics or business administration. There is an almost equal split between participants from OECD and non-OECD countries (51% versus 49%). Most respondents are from Europe (31%) followed by Asia and Africa (18% each), North America (15%), Latin America (11%), and Oceania (7%). Respondents were matched to a region by the home country they indicated in the survey. This was defined as the country whose climate policy they know best. In

most cases, the indicated home country aligned with nationality (for 88% of respondents in the negotiator sample, 87% in the scientist sample) and delegation membership (90% in the negotiator sample) of the respondent. Figure S1 in the SI illustrates the number of responses with respect to specific countries.

3.2 Questionnaire

The survey covered different aspects of international climate policy with a focus on the Paris Agreement. An earlier version of the survey was pre-tested at the Bonn Climate Change Conference (SB 50) in June 2019. The pre-test was conducted in the form of in-person qualitative interviews among six individuals from both developed and developing countries who have been involved in climate negotiations as either party member or observing party. The interviews took about one hour each. The pre-test participants were reimbursed for their time (100€ per participant). The goal of the pre-test was to find language and formulations that are unambiguously understood by the target audience. In many cases this meant that wording was adapted to formulations more commonly used in the diplomatic context in general (e.g., accountability instead of enforcement) or the Paris Agreement specifically (e.g., mitigation instead of abatement). In addition to the pre-test at the SB 50, one pre-test participant, with extensive experience as party member (more than 10 COPs), supported the project further in an advisory role up until the final version of the survey. This survey is focused squarely on attitudes of experts who are involved in climate diplomacy and the pre-testing regime used a similar sample. Had we expanded our survey to include experts who work only or mainly in the field of trade, our questions and pre-testing would have needed to be different and it might not have been possible to use a single survey instrument to address both the climate and trade populations.

The questionnaire started with a short introduction describing the subject of the survey. Here, we also provided a data protection declaration (in line with the General Data Protection Regulation of the EU) and obtained the respondents' consent to participate. After that, we asked participants to state their home country. The main part of the survey was organized into several blocks of questions. In the first part, relevant to this article, participants were asked to state their views on the linkage of trade and climate policy. The following part of the survey was concerned with the participants' assessments of the ambition and credibility of the Nationally Determined Contributions (NDCs) submitted by their home country and by selected other countries under the Paris Agreement. These results were the outcome of interest for the earlier analysis (Victor et al. 2022), and also serve as explanatory variables in this article. In the final part of the survey, we obtained information regarding the participants' personal background, such as gender, age, nationality, the field in which they have obtained their highest degree of training, the type of organization for which they work, and the number of COPs they have attended as a party member.

3.3 Dependent variables

The dependent variables—presented for the first time in this paper—are respondents' assessments concerning the legitimacy, usefulness, and risks associated with trade-climate linkages.

Regarding legitimacy, respondents were asked to the answer the following question:

"In your opinion, how legitimate would it be if importing countries implement linkage of trade policy with climate policy by applying the following measures?"

The two suggested measures were (1) "Raise tariffs on imports only from countries with low mitigation efforts." and (2) "Raise tariffs on imports indiscriminately from all countries in relation to the carbon content of the imports and domestic carbon price." The measure in (1) can be described as a "club-type trade measure" while the measure in (2) can be described as a "universal border adjustment (UBA)." The question on the legitimacy of these two measures refers to the experts' personal opinion on normative legitimacy, i.e., the moral right to use the institution to address the climate problem. Climate change diplomats are highly familiar with long-standing debates around topics where the interest of efficacy runs contrary to established norms for UN-based multilateral diplomacy—such as whether small "club" groups that might be more effective at promoting cooperation are legitimate because they violate norms of universality (Falkner 2016).

For both types of measures, assessments were elicited separately by using a Likert-type scale with five answer categories ranging from "(1) not legitimate at all" to "(5) very legitimate" and a "don't know" option. For our empirical analyses, we constructed dummy variables; the variables "club-type: legitimate" and "UBA: legitimate" take the value one if the respondent answered with either 4 or 5 on the Likert-type scale and zero otherwise ("don't know" responses are excluded).

Regarding usefulness, respondents were asked to the answer the following question:

"In your opinion, how useful for achieving mitigation of global emissions would it be if importing countries implement linkage of trade policy with climate policy by applying the following measures?"

The types of trade measures were the same as described above and assessments were elicited separately by using a Likert-type scale with five answer categories ranging from "(1) not useful at all" to "(5) very useful" and an "don't know" option. The variables "club-type: useful" and "UBA: useful" take the value one if the respondent answered with either 4 or 5 on the Likert-type scale and zero otherwise ("don't know" responses are excluded).

Additionally, respondents were asked about the risk in linking trade and climate policy without referring to any specific type of linkage:

"In your opinion, if there were linkage of trade agreements with climate policy, how high is the risk that such a linkage would erode international cooperation on trade among the involved countries without improving climate policy?"

Assessments were elicited on a Likert-type scale with five answer categories ranging from "(1) no risk at all" to "(5) very high risk" and a "don't know" option. The variable "linkage: risk" is constructed as a dummy variable that takes the value one if the respondent answered with either 4 or 5 on the Likert-type scale and zero otherwise ("don't know" responses are excluded).

3.4 Explanatory variables

The set of explanatory variables is based on the theoretical framework laid out in Section 2 and summarized in Table 2; it can be categorized into four clusters: geoeconomic position, quality of pledges, quality of national institutions, and the type of respondent. Variables on the country-level were matched to the respective participant based on the indicated home country.

The geoeconomic position is given by OECD membership and can be OECD Europe, OECD Rest of the World, or non-OECD Rest of the world (Organisation for Economic Co-operation and Development 2021). Additionally, we control for GDP per capita based on data provided by the World Bank (World Bank 2021a). We use the sum of imports and

exports of goods and services measured as a share of GDP based on World Bank data to control for dependency on trade (World Bank 2021b). To control for a country's dependence on the extractive fossil fuel industry, we include a variable that is the sum of oil, gas, and coal rents expressed as share of GDP based on data by the World Bank (World Bank 2021d, 2021e; c) as well as data on CO_2 per capita provided by the EU (Crippa et al. 2020).

The quality of pledges refers to the ambition and credibility of a country's NDC under the Paris Agreement. For ambition, respondents gave a subjective evaluation of their home country's NDC (in relation to economic strength) using a Likert-type scale with five answer categories ranging from "(1) not ambitious at all" to "(5) very ambitious" and a "don't know" option. "Ambition (our survey)" is constructed as a dummy variable that takes the value one if the respondent answered with either 4 or 5 on the Likert-type scale and zero otherwise ("don't know" responses are excluded). Respondents' subjective expectations about the credibility of their home country's NDC were elicited by asking them to state how confident they are that their home country will fulfill its current NDC. The assessments were elicited by means of a Likert-type scale with five answer categories ranging from "(1) not confident at all" to "(5) very confident" and a "don't know" option. "Credibility (our survey)" is constructed as a dummy variable that takes the value one if the respondent answered with either 4 or 5 on the Likert-type scale and zero otherwise ("don't know" responses are excluded).

We control for quality of national institutions by using the World Economic Forum's measure of government quality (Schwab and Zahidi 2020) along with Polity IV scores (Marshall et al. 2019).

The econometric models additionally include information on the respondents' backgrounds that was elicited in the final part of the survey. Here, we control for whether a respondent stems from the negotiator or scientist sample, whether the respondent works for a national government organization, their professional training, the number of COPs a respondent attended as a Party member, and their gender. Table S9 of the SI includes detailed descriptions of all variables and Table S10 reports descriptive statistics.

4 Results

4.1 Results on perceived legitimacy and usefulness

The main dependent variables in our analyses are the expert views on the legitimacy and usefulness of using universal border adjustments (UBAs) and club-type trade measures. For both types of measures, Fig. 1 indicates the share of respondents who see the respective measure as legitimate (left panel) and the share of respondents who see the respective measure as useful (right panel).

The figure shows that respondents from richer, industrialized (OECD) countries are more likely to assess both types of trade measures as legitimate than respondents from other countries. This difference is especially pronounced for UBAs: with 68% (OECD Europe: 72%, OECD North America: 65%, OECD Rest of World: 59%), the majority of respondents from OECD countries sees the introduction of border adjustments as legitimate while only 44% (non-OECD Asia: 42%, non-OECD Africa: 48%, non-OECD Rest of the world: 43%) of respondents from non-OECD countries share this view, indicating a statistically significant difference (χ^2=39.24, p<.001). There is also a statistically significant difference with respect to the assessment of legitimacy for club-type trade measures

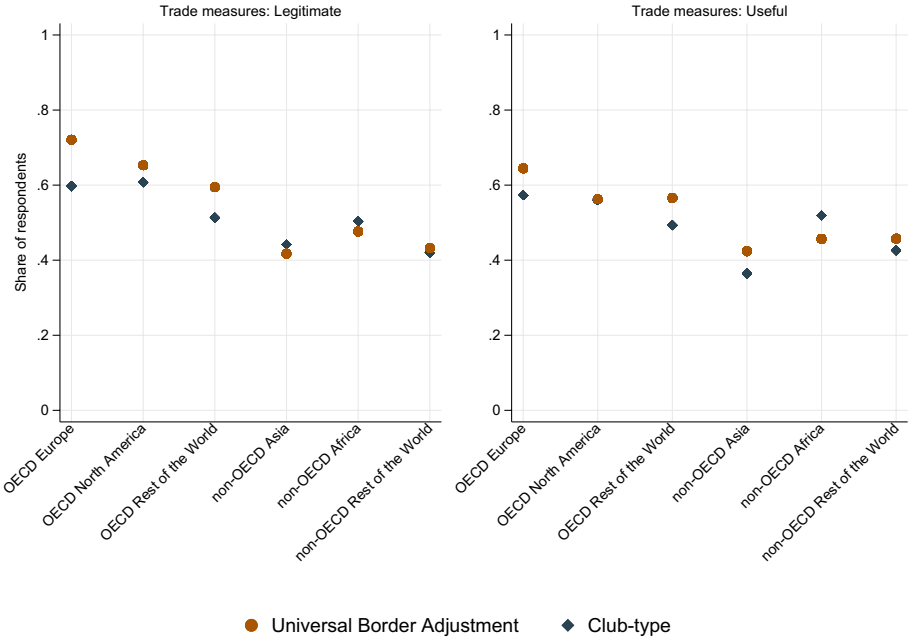

Fig. 1 Assessment of legitimacy and usefulness of universal border adjustment (UBA) and club-type trade measures. Share of respondents who indicate a high degree of legitimacy (left panel) or a high degree of usefulness (right panel) with respect to UBAs (circle markers) and club-type trade measures (diamond markers). High degree corresponds to answering with 4 or 5 on the respective 5-step Likert-type scale. Number of observations for left panel UBAs (left to right): n=197, n=98, n=74, n=91, n=128, n=125 and left panel club-type (left to right): n=201, n=102, n=74, n=95, n=131, n=124. Number of observations for right panel UBAs (left to right): n=197, n=96, n=76, n=92, n=127, n=129 and right panel club-type (left to right): n=204, n=100, n=75, n=96, n=129, n=129

(χ^2=11.63, p=.001) but of smaller magnitude: 58% of respondents from OECD countries see this type of measure as legitimate (OECD Europe: 60%, OECD North America: 61%, OECD Rest of the World: 51%) compared to 46% among respondents from non-OECD countries (non-OECD Asia: 44%, non-OECD Africa: 50%, non-OECD Rest of the World: 42%). A similar pattern emerges regarding usefulness: with 61% from OECD countries seeing trade measures as useful (OECD Europe: 64%, OECD North America: 56%, OECD Rest of the World: 57%) compared to 45% in the rest of the world (non-OECD Asia: 42%, non-OECD Africa: 46%, non-OECD Rest of the World: 46%). The share of respondents who describe border adjustments as useful is significantly higher for OECD countries than for non-OECD countries (χ^2=18.12, p<.001). Again, for club-type trade measures, the difference is smaller—55% (OECD Europe: 57%, OECD North America: 56%, OECD Rest of the World: 49%) compared to 44% (non-OECD Asia: 36%, non-OECD Africa: 52%, non-OECD Rest of the World: 43%)—but still statistically significant (χ^2=8.95, p=.003).

To investigate this further, we use the four clusters of explanatory variables suggested earlier (and summarized in Table 2) to explain variations in the dependent variables of legitimacy and usefulness for the respective trade measures. As there are high correlations between OECD membership, GDP per capita, and institutional quality (see Table S11 of the SI), Tables 3, 4, 5, and 6 report six different specifications to reduce

potential problems of multicollinearity. In each of the six specifications, a fixed set of variables is combined with different combinations of the correlated variables mentioned above: specification (1) only includes GDP per capita, specification (2) adds the institutional variables to this, specification (3) only includes the OECD membership variables, in specification (4) GDP per capita is added to this, specification (5) includes the OECD membership variables and institutional variables, and specification (6) contains the full set of variables jointly keeping the caveat of potential issues of multicollinearity in mind. As our dependent variables are dichotomous, we use binary probit models for all estimations and report marginal effects at the means of all other variables. In the SI we present robustness checks using ordered-probit models for the original 5-step Likert-type scale (Tables S14, S17, S20, and S23).

Tables 3 and 4 show the estimation results for the assessment of legitimacy of UBAs and club-type trade measures, respectively. The results are in line with the descriptive analyses presented before. The positive, statistically significant coefficients of GDP per capita as well as the negative, statistically significant coefficients for the OECD variables (compared to European OECD countries) indicate that respondents from richer, more industrialized countries see UBAs as more legitimate, and that this is especially pronounced for respondents from European OECD countries. For club-type trade measures, similar associations can be observed, although they are not consistently statistically significant. It is worth noting that assessments of the legitimacy of club-based trade measures (Table 4) show a high statistical significance for CO_2 emissions per capita: bigger polluters see higher legitimacy of the club approach but no higher usefulness and there are no significant associations for CO_2 per capita and the assessments for UBAs.

When controlling for geoeconomic and other explanatory variables, we find that respondents who perceive their home country as offering an ambitious pledge under the Paris Agreement are more skeptical regarding the legitimacy of UBAs. For club-type trade measures, the respective coefficients are not statistically significant. The results on the role of factor endowments are mixed. Fossil fuel rents have negative coefficients, but they are only weakly statistically significant for some specifications regarding UBAs. For both types of measures, trade dependency is not statistically significant in any of the specifications (see SI Tables S13 and S16 for robustness checks with a different measure of trade dependency/international involvement). With respect to individual-level characteristics, we find that respondents with a background in economics or business administration are more likely to assess UBAs as legitimate compared to respondents with a background in natural sciences. For club-type trade measures, having a background in the law correlates with seeing this type of trade measure as less legitimate compared to natural scientists. Also, respondents working for a national government are less likely to see linkage by club-type measures as legitimate compared to respondents working in other organizations.

The estimation results regarding the usefulness of UBAs and club-type trade measures are presented in Tables 5 and 6. For UBAs, the results from the descriptive analysis are again confirmed: respondents from countries with high GDP per capita are more likely to view UBAs as useful. The same is true for respondents from countries that are a member of the OECD. For club-type measures, the respective coefficients are not statistically significant. Again, we find no statistically significant association for trade dependency (see SI Tables S19 and S22 for robustness checks). For UBAs, there is a weakly significant, positive relationship for respondents with a background in economics or business administration. For club-type trade measures, we find that respondents working in a national government position have less optimistic views regarding the usefulness of these types of measures.

Table 3 Marginal effects (at means) from binary probit models, dependent variable: universal border adjustment: legitimate

	(1)	(2)	(3)	(4)	(5)	(6)
Geoeconomic position						
OECD RoW [d]			−0.1715**	−0.1309	−0.1620*	−0.1129
			(0.0780)	(0.0950)	(0.0869)	(0.0995)
Non-OECD RoW [d]			−0.3104***	−0.2448**	−0.3214***	−0.2522**
			(0.0682)	(0.1092)	(0.0977)	(0.1207)
GDP per capita [s]	0.1671***	0.1849**		0.0568		0.1010
	(0.0437)	(0.0733)		(0.0673)		(0.0833)
Share trade (% GDP) [s]	0.0174	0.0305	0.0106	0.0083	0.0200	0.0164
	(0.0327)	(0.0337)	(0.0277)	(0.0293)	(0.0299)	(0.0329)
Fossil fuel rents [s]	−0.0605**	−0.0449	−0.0471*	−0.0465*	−0.0285	−0.0305
	(0.0267)	(0.0366)	(0.0249)	(0.0251)	(0.0361)	(0.0365)
CO_2 per capita [s]	−0.0472	−0.0471	0.0354	0.0004	0.0295	−0.0102
	(0.0458)	(0.0474)	(0.0394)	(0.0582)	(0.0498)	(0.0607)
Quality of pledges						
Ambition (our survey) [d]	−0.1207**	−0.1264**	−0.1232**	−0.1246**	−0.1304**	−0.1280**
	(0.0511)	(0.0526)	(0.0517)	(0.0517)	(0.0531)	(0.0531)
Credibility (our survey) [d]	0.0077	0.0066	−0.0079	−0.0065	−0.0134	−0.0055
	(0.0528)	(0.0544)	(0.0539)	(0.0539)	(0.0552)	(0.0554)
Quality of institutions						
Institutional quality [s]		−0.0352			−0.0096	−0.0507
		(0.0607)			(0.0505)	(0.0598)
Polity index [s]		0.0387			0.0162	0.0156
		(0.0323)			(0.0325)	(0.0330)
Type of respondent						
IPCC Scientist [d]	0.0171	0.0332	0.0104	0.0052	0.0220	0.0189
	(0.0660)	(0.0665)	(0.0672)	(0.0675)	(0.0679)	(0.0680)
National government [d]	0.0450	0.0419	0.0530	0.0534	0.0503	0.0470
	(0.0546)	(0.0560)	(0.0542)	(0.0542)	(0.0551)	(0.0555)
Economics/business [d]	0.1348**	0.1521**	0.1290**	0.1285**	0.1498**	0.1453**
	(0.0643)	(0.0650)	(0.0647)	(0.0647)	(0.0648)	(0.0654)
Law [d]	0.0393	0.0671	0.0361	0.0379	0.0639	0.0607
	(0.0891)	(0.0894)	(0.0898)	(0.0893)	(0.0894)	(0.0897)
Other profession [d]	0.0437	0.0555	0.0427	0.0422	0.0522	0.0501
	(0.0561)	(0.0571)	(0.0562)	(0.0563)	(0.0571)	(0.0572)
Number of COPs [s]	−0.0060	−0.0034	−0.0071	−0.0080	−0.0050	−0.0066
	(0.0270)	(0.0276)	(0.0270)	(0.0270)	(0.0274)	(0.0276)
Male [d]	−0.0431	−0.0258	−0.0420	−0.0435	−0.0257	−0.0290
	(0.0544)	(0.0554)	(0.0547)	(0.0546)	(0.0558)	(0.0559)
Observations	454	435	454	454	435	435

Numbers indicate marginal effects at means (discrete effects for dummy variables) with standard errors in parentheses. Dummy variables are indicated with (d), standardized (mean = 0, s.d. = 1) continuous variables with (s). Significance levels are indicated by: *$p<0.10$, **$p<0.05$, ***$p<0.01$. The stochastic component in the models is assumed to be normally distributed. OECD Europe is the reference category for OECD membership variables. For ambition and credibility, low ratings are reference (1, 2, or 3 on Likert-type scale). Negotiator is reference for IPCC Scientist. All other organization types are reference for national government. Natural scientist is reference for professional training variables. Female, other genders, and prefer not to answer are reference for Male

Table 4 Marginal effects (at means) from binary probit models, dependent variable: club-type trade measure: legitimate

	(1)	(2)	(3)	(4)	(5)	(6)
Geoeconomic position						
OECD RoW [d]			−0.1443*	−0.1840**	−0.1702**	−0.2015**
			(0.0765)	(0.0867)	(0.0836)	(0.0895)
Non-OECD RoW [d]			−0.0853	−0.1537	−0.1436	−0.1900*
			(0.0711)	(0.1001)	(0.0993)	(0.1086)
GDP per capita [s]	0.0207	0.0029		−0.0575		−0.0727
	(0.0425)	(0.0689)		(0.0621)		(0.0766)
Share trade (% GDP) [s]	−0.0006	0.0128	−0.0228	−0.0199	−0.0167	−0.0124
	(0.0286)	(0.0298)	(0.0296)	(0.0293)	(0.0308)	(0.0309)
Fossil fuel rents [s]	−0.0220	0.0286	−0.0194	−0.0202	0.0268	0.0288
	(0.0247)	(0.0397)	(0.0255)	(0.0256)	(0.0413)	(0.0409)
CO_2 per capita [s]	0.0928**	0.0975**	0.1265***	0.1619***	0.1432***	0.1709***
	(0.0439)	(0.0462)	(0.0398)	(0.0555)	(0.0491)	(0.0582)
Quality of pledges						
Ambition (our survey) [d]	−0.0564	−0.0780	−0.0590	−0.0590	−0.0765	−0.0802
	(0.0517)	(0.0532)	(0.0519)	(0.0519)	(0.0532)	(0.0534)
Credibility (our survey) [d]	0.0319	0.0305	0.0182	0.0176	0.0192	0.0138
	(0.0527)	(0.0547)	(0.0534)	(0.0536)	(0.0552)	(0.0557)
Quality of institutions						
Institutional quality [s]		0.0072			−0.0337	−0.0025
		(0.0576)			(0.0481)	(0.0580)
Polity index [s]		0.0046			−0.0166	−0.0146
		(0.0322)			(0.0339)	(0.0341)
Type of respondent						
IPCC Scientist [d]	−0.0871	−0.0811	−0.0950	−0.0885	−0.0910	−0.0874
	(0.0653)	(0.0664)	(0.0650)	(0.0656)	(0.0665)	(0.0667)
National government [d]	−0.1405**	−0.1430**	−0.1360**	−0.1364**	−0.1427**	−0.1403**
	(0.0549)	(0.0567)	(0.0550)	(0.0549)	(0.0564)	(0.0565)
Economics/business [d]	−0.0792	−0.0479	−0.0870	−0.0860	−0.0599	−0.0561
	(0.0693)	(0.0715)	(0.0692)	(0.0692)	(0.0711)	(0.0713)
Law [d]	−0.2341***	−0.2223**	−0.2367***	−0.2371***	−0.2334**	−0.2301**
	(0.0905)	(0.0954)	(0.0898)	(0.0902)	(0.0932)	(0.0941)
Other profession [d]	−0.0198	−0.0102	−0.0208	−0.0208	−0.0154	−0.0143
	(0.0570)	(0.0585)	(0.0571)	(0.0571)	(0.0587)	(0.0587)
Number of COPs [s]	−0.0380	−0.0359	−0.0395	−0.0388	−0.0397	−0.0385
	(0.0266)	(0.0269)	(0.0265)	(0.0264)	(0.0268)	(0.0267)
Male [d]	0.0727	0.0772	0.0714	0.0735	0.0737	0.0767
	(0.0546)	(0.0557)	(0.0551)	(0.0551)	(0.0561)	(0.0562)
Observations	466	445	466	466	445	445

Numbers indicate marginal effects at means (discrete effects for dummy variables) with standard errors in parentheses. Dummy variables are indicated with (d), standardized (mean = 0, s.d. = 1) continuous variables with (s). Significance levels are indicated by: *$p<0.10$, **$p<0.05$, ***$p<0.01$. The stochastic component in the models is assumed to be normally distributed. OECD Europe is the reference category for OECD membership variables. For ambition and credibility, low ratings are reference (1, 2, or 3 on Likert-type scale). Negotiator is reference for IPCC Scientist. All other organization types are reference for national government. Natural scientist is reference for professional training variables. Female, other genders, and prefer not to answer are reference for Male

Table 5 Marginal effects (at means) from binary probit models, dependent variable: universal border adjustment: useful

	(1)	(2)	(3)	(4)	(5)	(6)
Geoeconomic position						
OECD RoW [d]			−0.1956***	−0.2141**	−0.1898**	−0.1917**
			(0.0746)	(0.0878)	(0.0832)	(0.0913)
Non-OECD RoW [d]			−0.1704**	−0.2007**	−0.1638*	−0.1666
			(0.0698)	(0.1021)	(0.0989)	(0.1110)
GDP per capita [s]	0.0763*	0.0686		−0.0253		−0.0040
	(0.0423)	(0.0694)		(0.0636)		(0.0782)
Share trade (% GDP) [s]	0.0108	0.0194	−0.0118	−0.0109	−0.0050	−0.0049
	(0.0285)	(0.0298)	(0.0276)	(0.0278)	(0.0295)	(0.0299)
Fossil fuel rents [s]	−0.0340	−0.0547	−0.0309	−0.0314	−0.0579	−0.0578
	(0.0270)	(0.0373)	(0.0270)	(0.0269)	(0.0383)	(0.0383)
CO_2 per capita [s]	0.0092	0.0162	0.0743*	0.0900	0.0860*	0.0876
	(0.0450)	(0.0469)	(0.0403)	(0.0572)	(0.0500)	(0.0595)
Quality of pledges						
Ambition (our survey) [d]	−0.0781	−0.0741	−0.0846	−0.0845	−0.0779	−0.0781
	(0.0511)	(0.0530)	(0.0515)	(0.0515)	(0.0532)	(0.0532)
Credibility (our survey) [d]	0.0203	0.0337	0.0043	0.0039	0.0197	0.0194
	(0.0521)	(0.0541)	(0.0531)	(0.0532)	(0.0548)	(0.0551)
Quality of institutions						
Institutional quality [s]		−0.0075			−0.0157	−0.0141
		(0.0588)			(0.0495)	(0.0595)
Polity index [s]		0.0386			0.0226	0.0226
		(0.0321)			(0.0330)	(0.0330)
Type of respondent						
IPCC Scientist [d]	0.0345	0.0519	0.0320	0.0346	0.0510	0.0512
	(0.0658)	(0.0667)	(0.0665)	(0.0665)	(0.0674)	(0.0673)
National government [d]	0.0374	0.0366	0.0485	0.0490	0.0456	0.0458
	(0.0551)	(0.0567)	(0.0551)	(0.0551)	(0.0566)	(0.0567)
Economics/business [d]	0.1115*	0.1253*	0.1049	0.1048	0.1189*	0.1191*
	(0.0662)	(0.0680)	(0.0669)	(0.0670)	(0.0685)	(0.0686)
Law [d]	0.0918	0.1397	0.0929	0.0929	0.1392	0.1393
	(0.0921)	(0.0898)	(0.0913)	(0.0912)	(0.0886)	(0.0886)
Other profession [d]	−0.0014	0.0221	0.0006	0.0008	0.0213	0.0214
	(0.0561)	(0.0576)	(0.0561)	(0.0561)	(0.0576)	(0.0576)
Number of COPs [s]	0.0059	0.0046	0.0050	0.0052	0.0034	0.0034
	(0.0268)	(0.0274)	(0.0268)	(0.0268)	(0.0274)	(0.0274)
Male [d]	−0.0396	−0.0300	−0.0386	−0.0378	−0.0302	−0.0301
	(0.0534)	(0.0548)	(0.0539)	(0.0540)	(0.0553)	(0.0554)
Observations	460	440	460	460	440	440

Numbers indicate marginal effects at means (discrete effects for dummy variables) with standard errors in parentheses. Dummy variables are indicated with (d), standardized (mean = 0, s.d. = 1) continuous variables with (s). Significance levels are indicated by: *$p<0.10$, **$p<0.05$, ***$p<0.01$. The stochastic component in the models is assumed to be normally distributed. OECD Europe is the reference category for OECD membership variables. For ambition and credibility, low ratings are reference (1, 2, or 3 on Likert-type scale). Negotiator is reference for IPCC Scientist. All other organization types are reference for national government. Natural scientist is reference for professional training variables. Female, other genders, and prefer not to answer are reference for Male

Table 6 Marginal effects (at means) from binary probit models, dependent variable: club-type trade measures: useful

	(1)	(2)	(3)	(4)	(5)	(6)
Geoeconomic position						
OECD RoW [d]			−0.0660	−0.0963	−0.0940	−0.1124
			(0.0750)	(0.0869)	(0.0826)	(0.0898)
Non-OECD RoW [d]			−0.0581	−0.1093	−0.0894	−0.1159
			(0.0700)	(0.1008)	(0.0994)	(0.1111)
GDP per capita [s]	0.0092	0.0017		−0.0427		−0.0422
	(0.0420)	(0.0671)		(0.0621)		(0.0763)
Share trade (% GDP) [s]	0.0176	0.0320	0.0058	0.0075	0.0149	0.0172
	(0.0270)	(0.0287)	(0.0283)	(0.0280)	(0.0303)	(0.0301)
Fossil fuel rents [s]	−0.0073	0.0038	−0.0039	−0.0045	0.0031	0.0043
	(0.0262)	(0.0398)	(0.0269)	(0.0269)	(0.0411)	(0.0408)
CO_2 per capita [s]	0.0123	0.0311	0.0217	0.0482	0.0554	0.0714
	(0.0438)	(0.0460)	(0.0388)	(0.0552)	(0.0487)	(0.0578)
Quality of pledges						
Ambition (our survey) [d]	−0.0472	−0.0686	−0.0496	−0.0493	−0.0686	−0.0704
	(0.0507)	(0.0521)	(0.0507)	(0.0508)	(0.0521)	(0.0522)
Credibility (our survey) [d]	−0.0376	−0.0291	−0.0457	−0.0460	−0.0353	−0.0386
	(0.0514)	(0.0535)	(0.0521)	(0.0521)	(0.0539)	(0.0543)
Quality of institutions						
Institutional quality [s]		−0.0015			−0.0266	−0.0079
		(0.0569)			(0.0482)	(0.0573)
Polity index [s]		0.0011			−0.0121	−0.0110
		(0.0309)			(0.0325)	(0.0325)
Type of respondent						
IPCC Scientist [d]	−0.0143	−0.0124	−0.0214	−0.0175	−0.0188	−0.0173
	(0.0641)	(0.0653)	(0.0640)	(0.0644)	(0.0656)	(0.0657)
National government [d]	−0.1043*	−0.1113**	−0.0999*	−0.1000*	−0.1097*	−0.1083*
	(0.0544)	(0.0562)	(0.0545)	(0.0545)	(0.0561)	(0.0561)
Economics/business [d]	−0.0372	−0.0356	−0.0418	−0.0412	−0.0426	−0.0407
	(0.0683)	(0.0704)	(0.0681)	(0.0680)	(0.0701)	(0.0701)
Law [d]	−0.1307	−0.1190	−0.1306	−0.1303	−0.1238	−0.1214
	(0.0962)	(0.0991)	(0.0961)	(0.0965)	(0.0988)	(0.0991)
Other profession [d]	0.0387	0.0339	0.0382	0.0386	0.0313	0.0319
	(0.0558)	(0.0574)	(0.0558)	(0.0558)	(0.0574)	(0.0574)
Number of COPs [s]	−0.0225	−0.0256	−0.0230	−0.0228	−0.0275	−0.0270
	(0.0259)	(0.0265)	(0.0259)	(0.0258)	(0.0264)	(0.0263)
Male [d]	0.0209	0.0013	0.0198	0.0210	−0.0012	0.0002
	(0.0533)	(0.0545)	(0.0533)	(0.0534)	(0.0546)	(0.0547)
Observations	470	450	470	470	450	450

Numbers indicate marginal effects at means (discrete effects for dummy variables) with standard errors in parentheses. Dummy variables are indicated with (d), standardized (mean = 0, s.d. = 1) continuous variables with (s). Significance levels are indicated by: *$p<0.10$, **$p<0.05$, ***$p<0.01$. The stochastic component in the models is assumed to be normally distributed. OECD Europe is the reference category for OECD membership variables. For ambition and credibility, low ratings are reference (1, 2, or 3 on Likert-type scale). Negotiator is reference for IPCC Scientist. All other organization types are reference for national government. Natural scientist is reference for professional training variables. Female, other genders, and prefer not to answer are reference for Male

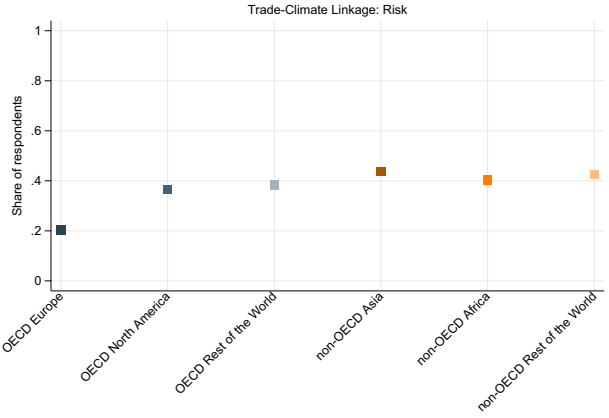

Fig. 2 Assessment of risk associated with linkage of trade and climate policy. Share of respondents who indicate a high degree of risk concerning the linkage of trade and climate policy. High degree corresponds to answering with 4 or 5 on the 5-step Likert-type scale. Number of observations (left to right) n=207, n=93, n=73, n=103, n=139, n=127

4.2 Results on perceived risk

Figure 2 shows the share of respondents who perceive the linkage of climate to trade measures as risky. Our survey question elicited a general assessment of the risk that can arise when climate policy and trade policy are linked and did not specify the type of linkage. The figure shows that respondents from European OECD countries in particular tend to see less risk involved in linking climate to trade measures than respondents from other countries. Only 20% of respondents from European OECD countries see a high risk involved in linkage, whereas this share is significantly higher for all other country groups (OECD North America: 37% [χ^2=8.98, p=.003], OECD Rest of the World: 38% [χ^2=9.39, p=.002], non-OECD Asia: 44% [χ^2=18.65, p<.001], non-OECD Africa: 40% [χ^2=16.38, p<.001], non-OECD Rest of the World: 43% [χ^2=18.99, p<.001]).

Using the same set of explanatory variables as for legitimacy and usefulness, we can show that this finding also holds in a multivariate context (Table 7), although some of the non-OECD dummy variables lose significance in some models. In addition, we find that respondents who perceive their home country as ambitious in the Paris Agreement have a more pessimistic attitude toward the risk of linking climate and trade. The quality of institutions in the home country is associated with lower perceived risk. Tables S26, S27, and S28 of the SI include robustness checks for these results.

5 Discussion

We began this study with the expectation that respondents' views on the linkage of climate policy and trade would vary depending on their personal beliefs and background as well as other attributes, such as their home country's position in the world. Prior literature informed our expectation that geoeconomic factors, including economic achievement, trade and fossil fuel dependencies, institutional quality, policy ambition, and personal attitudes toward the Paris Agreement approach, would influence respondents' views on trade measures. The empirical results are consistent with some expectations, although many factors we expected to be important (trade dependency, fossil fuel rents) were not correlated with our dependent variables.

Table 7 Marginal effects (at means) from binary probit models, dependent variable: trade-climate linkage: risk

	(1)	(2)	(3)	(4)	(5)	(6)
Geoeconomic position						
OECD RoW [d]			0.2155***	0.1773**	0.1475*	0.1720**
			(0.0756)	(0.0861)	(0.0831)	(0.0868)
Non-OECD RoW [d]			0.1310*	0.0690	0.0034	0.0383
			(0.0684)	(0.0976)	(0.0926)	(0.1008)
GDP per capita [s]	−0.0929**	0.0131		−0.0500		0.0475
	(0.0401)	(0.0630)		(0.0577)		(0.0676)
Share trade (% GDP) [s]	−0.0352	−0.0446*	−0.0124	−0.0120	−0.0215	−0.0220
	(0.0257)	(0.0259)	(0.0253)	(0.0262)	(0.0277)	(0.0271)
Fossil fuel rents [s]	0.0410*	0.0200	0.0444**	0.0441**	0.0323	0.0310
	(0.0210)	(0.0354)	(0.0221)	(0.0221)	(0.0362)	(0.0363)
CO_2 per capita [s]	0.0393	0.0391	−0.0560	−0.0249	−0.0051	−0.0242
	(0.0419)	(0.0436)	(0.0375)	(0.0510)	(0.0463)	(0.0528)
Quality of pledges						
Ambition (our survey) [d]	0.0990**	0.1086**	0.1024**	0.1029**	0.1095**	0.1115**
	(0.0476)	(0.0490)	(0.0474)	(0.0475)	(0.0489)	(0.0489)
Credibility (our survey) [d]	−0.0147	0.0031	−0.0021	−0.0036	0.0107	0.0149
	(0.0475)	(0.0495)	(0.0480)	(0.0480)	(0.0496)	(0.0501)
Quality of institutions						
Institutional quality [s]		−0.1157**			−0.1018**	−0.1209**
		(0.0541)			(0.0456)	(0.0542)
Polity index [s]		−0.0057			−0.0018	−0.0026
		(0.0270)			(0.0283)	(0.0284)
Type of respondent						
IPCC Scientist [d]	0.0372	0.0554	0.0314	0.0356	0.0555	0.0547
	(0.0622)	(0.0630)	(0.0625)	(0.0629)	(0.0638)	(0.0639)
National government [d]	−0.0116	−0.0080	−0.0180	−0.0173	−0.0110	−0.0136
	(0.0516)	(0.0524)	(0.0509)	(0.0511)	(0.0525)	(0.0521)
Economics/business [d]	−0.0245	−0.0461	−0.0251	−0.0246	−0.0452	−0.0477
	(0.0630)	(0.0637)	(0.0629)	(0.0629)	(0.0628)	(0.0629)
Law [d]	0.0598	0.0686	0.0570	0.0578	0.0680	0.0652
	(0.1001)	(0.1033)	(0.0985)	(0.0991)	(0.1029)	(0.1026)
Other profession [d]	0.0361	0.0521	0.0302	0.0309	0.0489	0.0482
	(0.0530)	(0.0542)	(0.0533)	(0.0533)	(0.0543)	(0.0544)
Number of COPs [s]	0.0125	0.0125	0.0109	0.0112	0.0118	0.0114
	(0.0243)	(0.0243)	(0.0245)	(0.0244)	(0.0243)	(0.0243)
Male [d]	−0.0368	−0.0463	−0.0355	−0.0353	−0.0442	−0.0445
	(0.0513)	(0.0523)	(0.0514)	(0.0514)	(0.0527)	(0.0527)
Observations	465	444	465	465	444	444

Numbers indicate marginal effects at means (discrete effects for dummy variables) with standard errors in parentheses. Dummy variables are indicated with (d), standardized (mean = 0, s.d. = 1) continuous variables with (s). Significance levels are indicated by: *$p<0.10$, **$p<0.05$, ***$p<0.01$. The stochastic component in the models is assumed to be normally distributed. OECD Europe is the reference category for OECD membership variables. For ambition and credibility, low ratings are reference (1, 2, or 3 on Likert-type scale). Negotiator is reference for IPCC Scientist. All other organization types are reference for national government. Natural scientist is reference for professional training variables. Female, other genders, and prefer not to answer are reference for Male

First, we find important distinctions between rich and poor countries. As shown in Fig. 1, respondents from OECD countries, in general, view trade measures as more legitimate and useful than those from non-OECD countries. On risk, we find that European respondents are uniquely unconcerned with the risks of trade measures, relative to the rest of the world. Over the last three decades, Europe has been a reliable leader on climate change policy efforts even as European governments have been wary about imposing too much cost on local industry. Policies adopted have, for example, exempted (fully or partially) trade-exposed industries (Dolphin et al. 2019) and offered various forms of compensation such as free allocations of emission credits (Wettestad and Gulbrandsen 2017). Mindful of the limits to that approach, the European Carbon Border Adjustment Mechanism (CBAM) proposal was introduced in summer 2021, after our survey, but preparations were well under way at the time of the survey (Cosbey et al. 2019; European Commission 2021; Canada 2021). In the USA and other countries, these same debates are playing out, also often intertwined with protectionist politics (Flannery et al. 2020).

Second, in looking at the ambition and credibility of pledges, our theoretical framework pointed to two opposing interpretations. The standard expectation was that greater ambition and credibility in national pledges should make countries more accepting of trade measures because countries that do the most should also be most keen to level the economic playing field. When it comes to the special position of Europe, we find exactly that. Indeed, Europe is far along in implementing its border adjustment mechanism.

Controlling for Europe, however, we find the opposite: as perceived home-country ambition rises there is greater wariness about trade measures. This second result—that rising ambition is correlated with perceptions of less legitimacy and greater risk of trade measures—may reflect that climate policy experts intuitively know that active efforts to adopt national climate policies involve many implementation risks. The more effort a country makes, the greater the risks. Facing the prospect of punitive trade measures, countries may be less transparent about their activities—an outcome directly contrary to one of the central goals of the Paris framework, which is to elicit more information and trust around implementation efforts. Highly ambitious NDCs are also, in general, likely to be those that involve the most experimentation and risk, requiring countries to grapple with unknown policies and technologies needed to make big reductions in emissions. The more a country does in this realm, the more its experts may be aware of the difficulties of the tasks that lie ahead and resist trade measures that would punish them should their attempts come up short. This logic may also help explain why there is no statistically significant negative effect for ambition when it comes to club-type trade measures—countries may think it is easier to control risks of implementation when trade measures are applied in a club setting. Future research should probe these logics as they could play a large role in shaping the design of trade measures so they are politically more acceptable. (Such research may also help explain why we find a significant relationship between per capita CO2 emissions and perceived legitimacy of club-based trade measures. From theory, we did not expect that finding.)

Third, on the question of perceived risks, we find that the quality of government institutions is highly significant. In this case, respondents from countries with highly capable institutions are less likely to see trade measures as risky. This may reflect that those countries' representatives have greater confidence that, once they make policy pledges, they can implement them and, in addition, that their high-quality institutions can keep some of the dangers of using trade measures in check.

Efforts to forge links between trade and climate are advancing in the places that are already doing a lot to control emissions—notably Europe and the USA. At the same time, at recent climate change conferences, the countries least responsible for climate change

have shifted diplomatic discussions to focus on a different kind of economic incentive—compensation for the "loss and damage" caused by a changing climate. These many diverging agendas, with deep fissures between different countries, reveal the fragility of diplomacy on climate, trade, and other economic topics. Adding more points of disagreement, such as linkages to trade, could further erode diplomatic cooperation.

Our results suggest that diverging views on the need for trade-based enforcement are robust, associated with important attributes of countries such as their commitments, and likely to persist—suggesting that policy strategies favoring the use of trade measures must pay close attention to the conditions that will determine where and how trade measures can be implemented. Experts from many countries that are the biggest supporters of the Paris approach to climate cooperation also doubt the legitimacy of trade measures.

Our study also has some implications for future research. A key advance from this research is the ability to measure variables that benefit from having insights from people "in the room" at diplomatic and policy discussions. Trade measures have been reliably on the climate diplomacy agenda for decades, and thus the experts in this sample (especially the diplomats) are well positioned to opine on matters such as the legitimacy, usefulness, and risks associated with such measures. However, this and other studies that use expert samples point to the need for more research on how to obtain and use expert assessments reliably. Future work should unpack more fully how experts arrive at their assessments of legitimacy. Surely, they use heuristics, but which factors inform those heuristics and what conditions lead experts to adjust their heuristics? It would be useful to examine more closely how experts see tradeoffs between key concepts such as focusing cooperation on countries with the most credible commitments (which would favor small groups of highly committed governments) and broad participation (which would advance norms of universality) that inform both legitimacy and efficacy of international cooperation. Future work can also explore more deeply how the theory of change that is built into the Paris Agreement (i.e., voluntary pledges) interacts with the growing research in political economy about the need for more punitive measures such as trade sanctions. If future expert surveys included trade experts it would be possible to examine how the interactions between climate commitments and trade penalties are assessed from the perspective of people who focus more on trade than climate. We have suggested that ambitious policy pledges could be one proxy for belief in the voluntary logic of the Paris Agreement, which may explain the correlation between that metric and wariness about trade measures. However, better measurement of respondents' support for the theory of change in the Paris Agreement could offer richer explanations.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10584-023-03609-x.

Data Availability The dataset necessary to reproduce the findings of this study is publicly available in anonymized form at: https://doi.org/10.7910/DVN/A2A6MG. OECD membership data are available at: https://www.oecd.org/about/document/ratification-oecd-convention.htm. GDP per capita data are available at https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD?most_recent_value_desc=false. Trade dependency data are available at: https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS. Fossil fuel rent data are available at https://data.worldbank.org/indicator/NY.GDP.COAL.RT.ZS, https://data.worldbank.org/indicator/NY.GDP.NGAS.RT.ZS and https://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS. CO2 per capita data are available at https://edgar.jrc.ec.europa.eu/dataset_ghg60#p1. Insitiutional quality data are available at https://www.weforum.org/reports/the-global-competitiveness-report-2020. Polity IV data are available at https://www.systemicpeace.org/inscrdata.html.

Declarations

Competing interests The authors declare no competing interest.

References

Abbott KW, Snidal D (2000) Hard and soft law in international governance. Int Organ 54:421–456. https://doi.org/10.1162/002081800551280

Bacchus J (2017) The case for a WTO climate waiver. The Centre for International Governance Innovation

Bacchus J (2019) What is a climate response measure? In: Breaking the trade taboo in confronting climate change. Centre for International Governance Innovation

Bacchus J (2022) Trade links: new rules for a new world. Cambridge University Press, Cambridge

Barrett S (1997) The strategy of trade sanctions in international environmental agreements. Resour Energy Econ 19:345–361. https://doi.org/10.1016/S0928-7655(97)00016-X

Barrett S (2006) Environment and statecraft: the strategy of environmental treaty-making. Oxford University Press, New York

Barrett S, Dannenberg A (2022) The decision to link trade agreements to the supply of global public goods. J Assoc Environ Resour Econ 9:273–305. https://doi.org/10.1086/716902

Bodansky D (1993) The United Nations framework convention on climate change: a commentary. Yale J Int L 18:451–558

Bodansky D (1999) The legitimacy of international governance: a coming challenge for international environmental law? Am J Int Law 93:596–624. https://doi.org/10.2307/2555262

Bodansky D, Brunnée J, Rajamani L (2017) International climate change law. Oxford University Press, Oxford, New York

Böhringer C, Balistreri EJ, Rutherford TF, Weyant J (2012) The role of border carbon adjustment in unilateral climate policy: overview of an Energy Modeling Forum study (EMF 29). Energy Econ 34:S97–S110. https://doi.org/10.1016/j.eneco.2012.10.003

Bond K, Butler-Sloss S (2022) The energy transition in Europe: the shape of things to come. RMI

Bowen R, Broz JL, Burney J et al (2021) The role of trade in addressing climate change: recommendations for policies and practices. In: Center for Commerce and Diplomacy, School of Global Policy and Strategy, UC San Diego, Glasgow, Scotland. https://ccd.ucsd.edu/research/climate-and-trade-task-force.html#Report-Launch-Event:-Nov.-9,-20

Brunnée J, Toope SJ (2010) Legitimacy and legality in international law: an interactional account. Cambridge University Press, Cambridge

Canada D of F (2021) Consultation on border carbon adjustments. Department of Finance, Canada

Chance C (2021) Delivering a climate trade agenda: industry insights. World Economic Forum

Colgan JD, Green JF, Hale TN (2021) Asset revaluation and the existential politics of climate change. Int Organ 75:586–610. https://doi.org/10.1017/S0020818320000296

Cosbey A, Droege S, Fischer C, Munnings C (2019) Developing guidance for implementing border carbon adjustments: lessons, cautions, and research needs from the literature. Rev Environ Econ Policy 13:3–22. https://doi.org/10.1093/reep/rey020

Crippa M, Guizzardi D, Muntean M et al (2020) Fossil CO2 and GHG emissions of all world countries: 2020 report. Publications Office of the European Union, Luxembourg

Dannenberg A, Lumkowsky M, Carlton EK, Victor DG (2023) Naming and shaming as a strategy for enforcing the Paris Agreement: The role of political institutions and public concern. Proceedings of the National Academy of Sciences 120:0. https://doi.org/10.1073/pnas.2305075120

Dannenberg A, Sturm B, Vogt C (2010) Do equity preferences matter for climate negotiators? An Experimental Investigation. Environ Resource Econ 47:91–109. https://doi.org/10.1007/s10640-010-9366-5

Dannenberg A, Zitzelsberger S (2019) Climate experts' views on geoengineering depend on their beliefs about climate change impacts. Nat Clim Chang 9:769–775. https://doi.org/10.1038/s41558-019-0564-z

Dannenberg A, Zitzelsberger S, Tavoni A (2017) Climate negotiators' and scientists' assessments of the climate negotiations. Nat Clim Change 7:437–442. https://doi.org/10.1038/nclimate3288

Davidson M, Karplus VJ, Zhang D, Zhang X (2021) Policies and institutions to support carbon neutrality in China by 2060. EEEP 10. https://doi.org/10.5547/2160-5890.10.2.mdav
Davidson MR (2021) China's Power Outage | The Real Reasons Behind Beijing's Energy Crisis. Foreign Affairs. https://www.foreignaffairs.com/articles/china/2021-11-18/chinas-power-outage
Dias A, Seeuws S, Nosowicz A (2020) EU border carbon adjustment and the WTO: hand in hand towards tackling climate change. Glob Trade Cust J 15:15–23. https://doi.org/10.54648/gtcj2020004
Directorate General for External Policies (2020) Briefing: trade related aspects of a carbon border adjustment mechanism. A legal assessment. European Parliament
Dolphin G, Pollitt MG, Newbery DM (2019) The political economy of carbon pricing: a panel analysis. Oxford Economic Papers. https://doi.org/10.1093/oep/gpz042
Eisenstadt M, Kareev Y (1975) Aspects of human problem solving: the use of internal representations. Explorations in Cognition 308–346
European Commission (2021) Proposal for a Regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism
Falkner R (2016) The Paris Agreement and the new logic of international climate politics. Int Aff 92:1107–1125. https://doi.org/10.1111/1468-2346.12708
Finnegan JJ (2021) Institutions, climate change, and the foundations of long-term policymaking. https://doi.org/10.33774/apsa-2019-6ft75-v2
Flannery B, Hillman JA, Mares J, Porterfield MC (2020) Framework proposal for a US upstream GHG tax with WTO-compliant border adjustments: 2020 update. Resources for the Future
Franck TM (2006) The power of legitimacy and the legitimacy of power: international law in an age of power disequilibrium. Am J Int Law 100:88–106. https://doi.org/10.2307/3518832
Genovese F, Tvinnereim E (2019) Who opposes climate regulation? Business preferences for the European emission trading scheme. Rev Int Organ 14:511–542. https://doi.org/10.1007/s11558-018-9318-3
Hafner-Burton EM, Haggard S, Lake DA, Victor DG (2017) The behavioral revolution and international relations. Int Organ 71:S1–S31. https://doi.org/10.1017/S0020818316000400
Hafner-Burton EM, LeVeck BL, Victor DG, Fowler JH (2014) Decision maker preferences for international legal cooperation. Int Organ 68:845–876
Hillman J, Tippett A (2021) A new transatlantic agreement could hold the key to green steel and aluminum. In: Council on Foreign Relations. https://www.cfr.org/blog/new-transatlantic-agreement-could-hold-key-green-steel-and-aluminum. Accessed 13 Jan 2022
Hufbauer GC, Schott JJ, Hogan M, Kim J (2022) EU carbon border adjustment mechanism faces many challenges. Rochester, NY
IEA (2022) World Energy Outlook 2022. International Energy Agency, Paris
Keohane RO (2001) Governance in a partially globalized world. Am Polit Sci Rev 95:1–13. https://doi.org/10.1017/S0003055401000016
Khor M, Montes MF, Williams M, Yu VPB (2017) Promoting sustainable development by addressing the impacts of climate change response measures on developing countries. South Centre, Geneva
Koester S, Hart DM, Sly G (2021) Unworkable solution: carbon border adjustment mechanisms and global climate innovation. Information Technology and Innovation Foundation
Lamb WF, Minx JC (2020) The political economy of national climate policy: Architectures of constraint and a typology of countries. Energy Res Soc Sci 64:101429. https://doi.org/10.1016/j.erss.2020.101429
Maratou A (2021) Stakeholder reactions to the proposed EU carbon border adjustment mechanism. European Rountable on Climate Change and Sustainable Transition, Brussels, Belgium
Marshall MG, Gurr TR, Jaggers K (2019) Polity V: political regime characteristics and transitions, 1800-2018. Center for Systemic Peace
Mehling M, van Asselt H, Das K et al (2017) Designing border carbon adjustments for enhanced climate action. Climate Strategies
Morgan MG (2014) Use (and abuse) of expert elicitation in support of decision making for public policy. Proc Natl Acad Sci U S A 111:7176–7184. https://doi.org/10.1073/pnas.1319946111
Nordhaus W (2015) Climate clubs: overcoming free-riding in international climate policy. Am Econ Rev 105:1339–1370. https://doi.org/10.1257/aer.15000001
Organisation for Economic Co-operation and Development (2021) List of OECD member countries - ratification of the convention on the OECD. https://www.oecd.org/about/document/ratification-oecd-convention.htm. Accessed 1 Mar 2022
Porterfield M (2019) Border adjustments for carbon taxes, PPMs, and the WTO. Univ Pennsylvania J Int Law 41:1
Raustiala K (2005) Form and substance in international agreements. Am J Int Law 99:581–614. https://doi.org/10.2307/1602292

Schwab K, Zahidi S (2020) The global competitiveness report: how countries are performing on the road to recovery. World Economic Forum, Geneva
Tørstad V, Sælen H, Bøyum LS (2020) The domestic politics of international climate commitments: which factors explain cross-country variation in NDC ambition? Environ Res Lett 15:024021. https://doi.org/10.1088/1748-9326/ab63e0
Verleger P, Victor DG (2022) Opinion | why it's time to start caring much more about clean hydrogen. The New York Times
Victor DG (2011) Global warming gridlock: creating more effective strategies for protecting the planet. Cambridge University Press, Cambridge, UK, New York
Victor DG, Lumkowsky M, Dannenberg A (2022) Determining the credibility of commitments in international climate policy. Nat Clim Chang 12:793–800. https://doi.org/10.1038/s41558-022-01454-x
Victor DG, Raustiala K, Skolnikoff EB (1998) The implementation and effectiveness of international environmental commitments: theory and practice. In: International Institute for Applied Systems Analysis. MIT Press, Laxenburg, Austria: Cambridge, MA
Victor DG, Sabel CF (2022) Fixing the climate: strategies for an uncertain world. Princeton University Press, Princeton Oxford
Vidigal G, Venzke I (2022) Of false conflicts and real challenges: trade agreements, climate clubs, and border adjustments. Am J Int Law 116:202–207. https://doi.org/10.1017/aju.2022.34
Wettestad J, Gulbrandsen LH (2017) Chapter 3 EU emissions trading: frontrunner – and 'black sheep'? In: The Evolution of Carbon Markets: Design and Diffusion, 1st edn. Routledge, Abingdon, Oxon; New York
World Bank (2021a) GDP per capita, PPP (constant 2017 international $). World Development Indicators. https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD?most_recent_value_desc=false
World Bank (2021b) Trade (% of GDP). World Development Indicators
World Bank (2021c) Coal rents (% of GDP). World Development Indicators. https://data.worldbank.org/indicator/NY.GDP.COAL.RT.ZS
World Bank (2021d) Natural gas rents (% of GDP). World Development Indicators. https://data.worldbank.org/indicator/NY.GDP.NGAS.RT.ZS
World Bank (2021e) Oil rents (% of GDP). World Development Indicators. https://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS
World Trade Organization (2022) Trade and environmental sustainability structured discussions Summary Report 2022

Authors and Affiliations

Marcel Lumkowsky[1] · Emily K. Carlton[2] · David G. Victor[2,3,4,5] · Astrid Dannenberg[1,6]

✉ David G. Victor
david.victor@ucsd.edu

[1] Department of Economics, University of Kassel, Kassel, Germany

[2] School of Global Policy and Strategy, University of California San Diego, San Diego, CA, USA

[3] Scripps Institution of Oceanography, University of California San Diego, San Diego, CA, USA

[4] Department of Mechanical and Aerospace Engineering, Jacobs School of Engineering, University of California San Diego, San Diego, CA, USA

[5] The Brookings Institution, Washington, DC, USA

[6] Department of Economics, University of Gothenburg, Gothenburg, Sweden